Intraoperative TOE: How do we match effectiveness with comprehensiveness

John Kneeshaw

Papworth Hospital, Cambridge, UK

I would like to question how we use intraoperative TOE, and to make you think about how to employ your echo skills to the advantage of your patient.

In an article in BJA in 2006 somebody wrote, "(TOE) has resulted in a significant change in the role and status of the anaesthetist. In addition to our traditional responsibilities, we are now also able to provide vital clinical information for the conduct of surgery [1]. I was the somebody who wrote the article, but perhaps it is now time to re-evaluate.

TOE has become so much a part of modern cardiothoracic anaesthesia that cardiac anaesthesiologists accept it as a routine part of cardiac surgery. We have been trained and encouraged to aim for a comprehensive examination, but would a targeted or problem focussed echo be more appropriate? Would TOE be more productive if we knew what information we wanted, or what question was being asked before we started the examination? It is time to question the usefulness or effectiveness of intra-operative TOE in improving patient care?

The 'cockpit workload' of a cardiac anaesthesiologist has increased greatly over the past 10 years as more and more monitoring and diagnostic tools have been added to the array of instruments that we deal with. We apply the basic monitors that all general anaesthetists are familiar with, but we have added two or more invasive pressures, near infra red spectroscopy, BIS, near patient haematology, biochemistry and coagulation measurement, and our much loved TOE. But have we given enough thought to how we decide how much attention we give to the observation and manipulation of each of these devices? Or which of them truly has an impact on the well being of the patient in our care.

My version of a comprehensive TOE examination takes me at least 10 minutes in an uncomplicated patient with aortic valve disease. If the patient has some more complicated pathology like mitral valve disease, which requires the collection and assimilation of 3D data sets and some qualitative estimations, then the time will extend to 15 or 20 minutes. This time will extend further if I discover some unexpected pathology, or if the intra-operative findings differ from the findings of our colleagues in cardiology as advertised in the preoperative assessment. I will still need to do some off line work with the data acquired before I can say the TOE is done. I then need to repeat at least a part of the process after the patient has separated from bypass.

Is this a wise, safe and effective use of my time? Or would my patients be better served if I concentrated my time on the four things I was told to do when I first started in cardiac anaesthesia. They were: 1. Oxygenate and ventilate the patient. 2. Make sure that they are getting enough anaesthetic agent to stay asleep. 3. Keep the blood pressure in the Goldilocks zone. 4. Remember to give the Heparin. My medico legal experience tells me that cardiac anaesthetists get into trouble with the legal system most frequently because of failures to accomplish items 1 or 2; and I have not yet met an anaesthetist who was sued over a decision about whether the mitral lesion was P2 or P1.

Is TOE reducing the risk of harm to our patients, or might it be increasing it? The most recent publications on the effectiveness of,

and the indications for TOE are very persuasive [2,3]. I have been personally responsible for some of these works, but we should remember that a publication from the ASA and the SCA Task Force on Transoesophageal Echocardiography (or the European Association of Echocardiography) is unlikely to make recommendations suggesting that TOE it isn't always a worthwhile activity, because they are organisations that could not exist without TOE.

There are also a number of papers that highlight the ability of TOE to make unexpected findings, which may be significant in the surgical management of our patients [4,5]. Does this demonstrate a need for preoperative TOE, or does it more accurately demonstrate that we should invest more effort into the refinement of preoperative diagnosis? A large peri-operative TOE industry has grown up, of which I am part; and pronouncements from the TOE world are often accepted by cardiac anaesthesiologists (and others) without too much question.

There is no doubt that there are groups of patients that benefit from intra-operative TOE. In particular patients with unexplained haemodynamic instability or unexplained hypoxaemia; in these patients the TOE can truly be life saving. Should we pass a TOE probe into every patient so we are ready for the unexpected, or would we be better to wait until the event occurs and then pass the echo probe? Similarly, patients undergoing valvular repair surgery can benefit from TOE by having the result of the surgery tested immediately and problems corrected without a second operation, but what of patients undergoing routine coronary surgery, does the TOE confer a survival benefit? Or aortic valve replacement; do patients who undergo an aortic valve replacement without TOE because of some contraindication, do less well? TOE carries two sets of risks, the risk of harm done by the TOE itself, and the risks inherent in distracting the anaesthesiologist from other tasks. In a hospital performing around 2600 cases per year in which 70% of the patients get a TOE, the risk of serious oesophageal injury is around 1 in 2000. How many lives must the TOE save to make that risk acceptable? There is no data (nor will there ever be) about the collateral harm done by TOE. There is however good data from the aviation world about the psychological limits of humans trying to deal with too many tasks at once [6,7,8].

I know that in many institutions, including my own, TOE teaching and education is important and very frequently the only contribution of the echo is to teach the trainee. This is an acceptable reason for carrying out a comprehensive examination and it is essential for candidates preparing for TOE Certification [9]. If we use TOE in this way then we should be honest with ourselves, and our consent process should make sure that the patients understand that this is happening.

Perhaps we should provide two anaesthetists for cardiac surgery involving TOE to reduce the risks of anaesthetic inattention, but it would not be cost effective, nor would it remove the risk inherent in the TOE itself.

I am not sure that I have the answers to these questions, but I would like to explore them and perhaps make think more about how we use echo and ask ourselves what will the TOE contribute to this individual patient's care.

Above all - question dogma. Don't just do what everybody else does – think for yourself!

References

1. TOE in the operating room. Kneeshaw J D. British Journal of Anaesthesia 2006; 97 (1): 77-84
2. Flachskampf FA, Badano L, Daniel WG, Feneck RO, Fox KF, Fraser AG, Pasquet A, Pepi M, Perez de Isla L, Zamorano J. Transoesophageal Echocardiography (Update 2010). Eur J Echo 2010; 11: 557-576
3. Practice Guidelines for Perioperative Transesophageal Echocardiography; An Updated Report by the American Society of Anesthesiologists and the Society of Cardiovascular Anesthesiologists Task Force on Transesophageal Echocardiography. Anesthesiology 2010; 112: 1-1

4. Klein AA, Snell A, Nashef SAM, Hall RMO, Kneeshaw JD, Arrowsmith JE. The impact of intraoperative transoesophageal echocardiography on cardiac surgical practice. Anaesthesia 2009; 64: 947-52
5. Skinner HJ, Mahmoud A, Uddin A, Mathew T. An investigation into the causes of unexpected intra-operative transoesophageal echocardiography findings. Anaesthesia 2012; 67 (4): 355-60
6. Salas E, Maurino DE. Human factors in aviation 2010
7. The Interfaces Between Flightcrews and Modern Flight Deck Systems. FAA Human Factors Team, 1996
8. Human-centred cockpit study. Kenichiro Honda*, Yukihiko Nakata*, Naomasa Shinoda**. 2009; *Mitsubishi Heavy Industries, Ltd., **Japan Aircraft Development Corporation
9. Feneck R, Kneeshaw J, Fox K, Bettex D, Erb J, Flaschkampf F, Guarracino F, Ranucci M, Seeberger M, Sloth E, Tschernich H, Wouters P, Zamorano J. Reporting perioperative transoesophageal echo studies. Eur J Echo 2010; 11: 387-393